

I Claim:

1 **1.** An apparatus comprising:
2 a receiver support structure, wherein:
3 said receiver support structure has a central axis; and
4 said receiver support structure supports a plurality of receivers,
5 wherein said plurality of receivers are disposed at a first radial distance
6 from said central axis;
7 a first dispensing element, wherein:
8 said first dispensing element dispenses a first ingredient; and
9 said first dispensing element is disposed above said receiver support
10 structure at said first radial distance;
11 a drive system, wherein:
12 said drive system comprises a first drive; and
13 said drive system causes, via rotary motion, a relative movement
14 between said dispensing element and said receivers; and
15 a system controller, wherein:
16 said system controller comprises means for causing said dispensing
17 element to dispense said first ingredient as a plurality of pulses; and
18 each pulse contains less than twenty percent of a total amount of said
19 first ingredient to be delivered to one of said receivers.

1 **2.** The apparatus of claim 1 wherein each pulse contains less than ten percent
2 of the total amount of said first ingredient to be delivered to said one receiver.

1 **3.** The apparatus of claim 1 wherein each pulse contains less than one percent
2 of the total amount of said first ingredient to be delivered to said one receiver.

1 **4.** The apparatus of claim 1 wherein each pulse contains less than one-tenth of
2 one percent of the total amount of said first ingredient to be delivered to said one
3 receiver.

1 **5.** The apparatus of claim 1 wherein said drive system is rotatably coupled to
2 said first dispensing element.

1 **6.** The apparatus of claim 5 wherein said drive system comprises a rotatable
2 member, wherein said rotatable member has at least one arm, and wherein said first
3 dispensing element depends from said arm.

1 **7.** The apparatus of claim 6 wherein said drive system comprises a reservoir
2 support structure, wherein said reservoir support structure supports at least a first
3 reservoir.

1 **8.** The apparatus of claim 7 wherein said drive system comprises a drive shaft,
2 and wherein:
3 said rotatable member is coupled to said drive shaft; and
4 said reservoir support structure is coupled to said drive shaft.

1 **9.** The apparatus of claim 8 wherein said drive shaft is hollow, and further
2 comprising:
3 said first reservoir; and
4 a first conduit, wherein said first conduit passes through said drive shaft and
5 fluidically couples said first reservoir to said first dispensing element.

1 **10.** The apparatus of claim 1 further comprising a second drive, wherein said
2 receiver support structure is rotatably coupled to said second drive.

1 **11.** The apparatus of claim 10 wherein said second drive is physically adapted to
2 move said receiver support structure in step-wise fashion.

1 **12.** The apparatus of claim 1 wherein said drive system is rotatably coupled to
2 said receiver support structure.

1 **13.** The apparatus of claim 12 further comprising:
2 a non-rotatable member, wherein said first dispensing element depends from
3 said non-rotatable member; and
4 at least a first reservoir, wherein said first reservoir is disposed on said non-
5 rotatable member.

1 **14.** The apparatus of claim 1 wherein said receiver support structure is a
2 platform, wherein said platform comprises a plurality of removable segments,
3 wherein each segment accommodates one of said receivers.

1 **15.** The apparatus of claim 14 wherein said removable segments include a
2 stirrer drive.

1 **16.** The apparatus of claim 1 wherein said first dispensing element comprises a
2 nozzle, wherein said nozzle has:

3 an inner passageway leading to an orifice, wherein said inner passageway
4 receives said first ingredient and dispenses it through said orifice; and

5 a shroud, wherein:

6 said shroud surrounds said inner passageway;

7 said shroud receives a first fluid, and

8 said first fluid controls a flow of said ingredient out of said orifice.

1 **17.** The apparatus of claim 16 wherein said inner passageway is characterized by
2 a venturi configuration.

1 **18.** The apparatus of claim 1 further said plurality of receivers.

1 **19.** The apparatus of claim 18 comprising a sampling/mixing system, wherein,
2 said sampling/mixing system comprises:

3 a device for aspirating liquid from, and delivering it to, one of said receivers;

4 a conduit having a first end and a second end, wherein:

5 said first end is coupled to a port in said one receiver; and

6 said second end is coupled to said device for aspirating and delivering
7 liquid.

1 **20.** The apparatus of claim 19 further comprising an analysis window, wherein:

2 said analysis window is coupled to said conduit between said first end and

3 said second end; and

4 said analysis window is disposed beneath said receiver support structure.

1 **21.** The apparatus of claim 20 further comprising an analytical station, wherein
2 said analytical station is disposed beneath said receiver support structure, and
3 wherein said analytical station comprises:

4 an emitter, wherein said emitter emits radiation;

5 a detector, wherein said detector is coupled to analysis electronics; and

6 a space between said emitter and said detector, wherein said space defines
7 a testing region and wherein said testing region is physically adapted to receive
8 said analysis window.

1 **22.** An apparatus comprising:

2 a dispensing system, wherein said dispensing system has a first plurality of
3 dispensing elements for dispensing a second plurality of ingredients into a third
4 plurality of receivers;

5 a drive system, wherein said drive system causes, via a rotary motion, a
6 relative movement between said dispensing system and said receivers to align one of
7 said dispensing elements with one of said receivers; and

8 a system controller, wherein said system controller comprises:

9 means for causing said dispensing element to dispense each of said
10 ingredients as a plurality of pulses; and

11 means for determining flow rate of said second plurality of ingredients
12 into said third plurality of receivers on a per ingredient, per receiver
13 basis, said means for determining flow rate comprising:

14 a device for measuring total flow of each of said ingredients; and

15 means for apportioning said flow on a per ingredient, per
16 receiver basis.

1 **23.** The apparatus of claim 22 wherein said system controller further comprises
2 means for real-time adjustment of flow rate, wherein said means for real-time
3 adjustment of flow rate comprises means for changing a quantity of ingredient
4 contained in said pulses.

1 **24.** An apparatus comprising:

2 a dispensing system, wherein said dispensing system has a first plurality of
3 dispensing elements for dispensing a second plurality of ingredients into a third
4 plurality of receivers;

5 a drive system, wherein said drive system causes, via a rotary motion, a
6 relative movement between said dispensing system and said receivers to align one of
7 said dispensing elements with one of said receivers; and

8 a system controller, wherein said system controller comprises means for
9 distributed dispensing.

1 **25.** An apparatus comprising:

2 a first drive;

3 a rotatable member, wherein:

4 said rotatable member is coupled to said first drive; and

5 said rotatable member comprises a first arm and a second arm;

6 a first platform, wherein said first platform:

7 is disposed beneath said rotatable member;

8 supports a plurality of receivers; and

9 is coupled to a second drive;

10 a second platform, wherein said second platform:

11 is disposed beneath said first platform;

12 supports a plurality of reservoirs, and

13 is coupled to said first drive;

14 a first dispensing element, wherein said first dispensing element:

15 depends from said first arm; and

16 is fluidically coupled to at least a first one of said reservoirs; and

17 a second dispensing element, wherein said second dispensing element:

18 depends from said second arm; and

19 is fluidically coupled to at a second one of said reservoirs.

1 **26.** The apparatus of claim 25 further comprising:

2 a first liquid-transport system, wherein said first liquid-transport system

3 delivers a first liquid from said first reservoir to said first dispensing element; and

4 a second liquid-transport system, wherein said second liquid-transport

5 system delivers a second liquid from said second reservoir to said second dispensing

6 element.